METMINEC (PTY) LTD
MINING THE FUTURE

DESKTOP RESEARCH & RECONNAISSANCE SURVEY REPORT

LITHIUM EXPLORATION PROJECT IN THE HOMBOLO AREA IN TANZANIA

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Makgamatho Godfrey Mothapo ***Pr. Sci.Nat***

Date: September 2023

TABLE OF CONTENTS

LIST OF FIGURES iii
LIST OF TABLES iii
EXECUTIVE SUMMARY iv
1. INTRODUCTION 1
1.1. DESCRIPTION OF THE PROJECT AREA 1
2. BACKGROUND 4
2.1. OCCURRENCE OF LITHIUM ORE IN NATURE 4
2.1.1. Pegmatite Deposits 4
2.1.2. Brine Deposits 5
2.1.3. Sedimentary Deposits 6
3. GEOLOGICAL SETTING 6
3.1. REGIONAL GEOLOGY OF THE PROJECT AREA 6
3.2. LOCAL GEOLOGY OF THE PROJECT AREA 9
4. RECENT EXPLORATION WORK IN THE PROJECT AREA 10
5. TARGET GENERATION WITHIN CONCESSIONS 12
5.1. DATASETS 13
5.2. BAND RATIO 13
5.3. VALIDATION OF THE REMOTE SENSING RESULTS 14
6. RESULTS OF TARGET GENERATION 14
6.1. ACCURACY ASSESSMENT RESULTS 16
7. RECONNAISSANCE SURVEY FINDINGS & OBSERVATIONS 17
SUMMARY AND CONCLUSIONS 21
REFERENCES 23
APPENDICES 25

LIST OF FIGURES

Figure 1: Locality map of the project area. 2

Figure 2: Topographical map of the project area. 3

Figure 3: Tectonic region underlying the project area (KMB: Kariba Mobile Belt; MMB: Mozambique Mobile Belt) 8

Figure 4: Geological map of the project area (Geological Survey of Tanzania). 11

.... 11

Figure 5: Recent exploration and mining operations in the project area. 12

Figure 6: A true colour image showing areas with high potential of spodumene in Hombolo. Historic Hombolo Lithium Block is superimposed as well. 15

Figure 7: Lepidolite superimposed on satellite image. 16

Figure 8: ROC curve showing the accuracy of mineral mapping results (SPM: Spodumene-Lepidolite Map) 17

Figure 9: Stakeholder engagement and project introduction. 18

Figure 10: Hombolo mine pit showing the pegmatite intrusion. 19

Figure 11: Hombolo mine pit showing the pegmatite intrusion. 20

Figure 12: Typical pegmatite ore. 20

LIST OF TABLES

Table 1: Spectral and spatial characteristics of Landsat 8 (OLI) bands. 13

EXECUTIVE SUMMARY

Metminec (Pty) Ltd was appointed by **CGRA Mining Inc.** to conduct desktop research and undertake a reconnaissance survey of selected sites in order to generate potential follow-up targets for lithium exploration on several prospecting concessions located in the Hombolo area in Tanzania.

As the global thrust towards energy transition accelerates, demand for lithium is projected to soar from $525.8 million in 2021 to an estimated $1.4 billion by 2026, marking a CAGR of 20.8%.

In Tanzania's neighbor, the DRC, the world-class Roche Dure lithium deposit is located, which is currently being developed by AVZ Minerals at its Manono hard-rock Lithium project.

The deposit has a measured and indicated resource of 401 million tonnes at average grades of 1.65% lithium oxide for 6.64 million tonnes of contained lithium oxide.

Estimated pre-production capital cost for Manono of US$545 million and a cracking average annual EBITDA forecast of more than US$400 million a year.

The below articles contain further information on this project:

1. Enhanced resource could improve Manono economics for AVZ

2. Manono lithium project is poised to produce roughly 700,000 tons per year of high-grade lithium over its 20-year mine life

The best currently known lithium deposits in Tanzania are located in the following areas:

- Kilimanjaro Region: This region is home to the *Titan 1 and Titan 2* lithium projects, which are being explored by China Dongsheng International Inc. (OTC Markets: CDSG), through its wholly owned subsidiary Titan Lithium, Inc.

The below articles contain further information on these projects:

1. US firm joins rush for new lithium deposits in Tanzania

2. CDSG AUGER DRILL PROGRAM TO BEGIN ON TITAN PROPERTIES

- Auroch Minerals - Hombolo project: Auroch, which has made the strategic decision to couple its gold expertise with opportunities in lithium. The below article contain further information on these projects:

1. Auroch Minerals acquires lithium project in Tanzania

- Liontown Resources: Adjacent to Auroch Minerals, Liontown Resources has also made a significant Lithium discovery as per the article below:

1. Liontown Resources discovers lithium zone in Tanzania

- Cassius Mining: In Hombolo region, Cassius mining is actively exploring Lithium deposits too as per the articles below:

1. Geology of Tanzania and location of the Chenene Lithium Project

2. About the CHENENE LITHIUM PROJECT

Lithium is a critical alkali metal used in various applications, especially in the production of rechargeable batteries, which are used in a wide range of devices such as electric vehicles, mobile phones, laptops, and energy storage systems.

Moreover, because of the increase of strategic emerging industries, such as aerospace, and its use in nuclear and new forms of energy, the demand for lithium has rapidly risen. This has ultimately led to the increase of lithium resource exploration and research on accessing lithium resources world-wide.

Lithium-bearing minerals are typically found in granitic pegmatites, sedimentary and brine deposits. In the project areas of interest, lithium deposits in a form of spodumene and lepidolite are found in pegmatites hosted by amphibolite schist, quartzite, quartz-feldspar gneiss and granites.

In the desktop research, Landsat 8 (OLI) images were processed to locate areas that have potential to host lithium deposits by spectrally mapping lithium-bearing minerals: spodumene and lepidolite.

Based on the mineral mapping results, follow-up targets were generated within the concessions. The results also show areas known to host lithium-bearing pegmatites around the Hombolo area as spodumene and lepidolite anomalies.

This increases the level of confidence that can be attributed to the mineral mapping results. In addition, onsite reconnaissance surveys and field observations further validate the accuracy of the results because the sites visited, following the generated mineral maps, are characterized by pegmatites or materials associated with pegmatites.

Based on the combined interpretation of mineral mapping results, topography, geology and the reconnaissance survey, concessions: PL/11955/2022; a portion of PL/17271/2021; and PL/19510/2022 were assigned highest prospectivity level among the concessions in Hombolo area. These concessions are characterized by high anomalies of spectrally mapped lithium-bearing minerals, flat terrain and proximal to known pegmatites.

In addition, PL/11955/2022 is along the Hombolo-Msangani belt which is a host to Hombolo lithium-bearing pegmatites.

A portion of PL/17271/2021 is adjacent to the Auroch Lithium Exploration Project Block. The Auroch block is part of the Hombolo Lithium Block.

Furthermore, considering the accuracy acquired by mineral maps, these maps together with existing geological maps can form the basis for selection of new prospective areas for future lithium prospecting right applications.

Lithium is a critical alkali metal used in various applications, especially in the production of rechargeable batteries, which are used in a wide range of devices such as electric vehicles, mobile phones, laptops, and energy storage systems. Moreover, because of the increase of strategic emerging industries, such as aerospace, and its use in nuclear and new forms of energy, the demand for lithium has rapidly risen. This has ultimately led to the increase of lithium resource exploration and research on accessing lithium resources world-wide.

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In the desktop research, Landsat 8 (OLI) images were processed to locate areas that have potential to host lithium deposits by spectrally mapping lithium-bearing minerals: spodumene and lepidolite. Based on the mineral mapping results, follow-up targets were generated within the concessions. The results also show areas known to host lithium-bearing pegmatites around Hombolo area as spodumene and lepidolite anomalies. This increases the level of confidence that can be attributed to the mineral mapping results. In addition, onsite reconnaissance surveys and field observations further validate the accuracy of the results because the sites visited, following the generated mineral maps, are characterized by pegmatites or materials associated with pegmatites.

Based on the combined interpretation of mineral mapping results, topography, geology and the reconnaissance survey, Metminec recommends chip sampling and geophysical survey within the prospecting right concession to further delineate the observed pegmatite intrusion for possible drilling. Furthermore, considering the accuracy acquired by mineral maps, these maps together with existing geological maps can form the basis for selection of new prospective areas for future lithium prospecting right applications.

1. INTRODUCTION

Metminec (Pty) Ltd was appointed by CGRA Mining to conduct detailed desktop research and undertake a reconnaissance survey of selected sites for potential lithium exploration in Tanzania. The specific objectives of this desktop research and field observations were to:

- Generate potential follow-up targets for lithium exploration in several prospecting tenements/concessions in the Hombolo area;
- Establish new prospective areas for lithium exploration which must be targeted for future prospecting license application.

1.1. DESCRIPTION OF THE PROJECT AREA

The project area extends over Dodoma and Manyara Regions of Tanzania. Hombolo is situated about 35 km south-east of the capital city, Dodoma. (Figure 1). Topographically the project area occupies the central plateau of Tanzania with an elevation ranging from 1200 to 1500 m above sea level (Figure 2). This area is characterized by a semi-arid climate with relatively warm temperatures throughout the year that varies according to altitude ranging from 15 degrees Celsius in July to 30 degrees Celsius in October. It receives an average of 570 mm of precipitation per year, the bulk of which occurs during its wet seasons between November and April (Kisamba and Li, 2023).

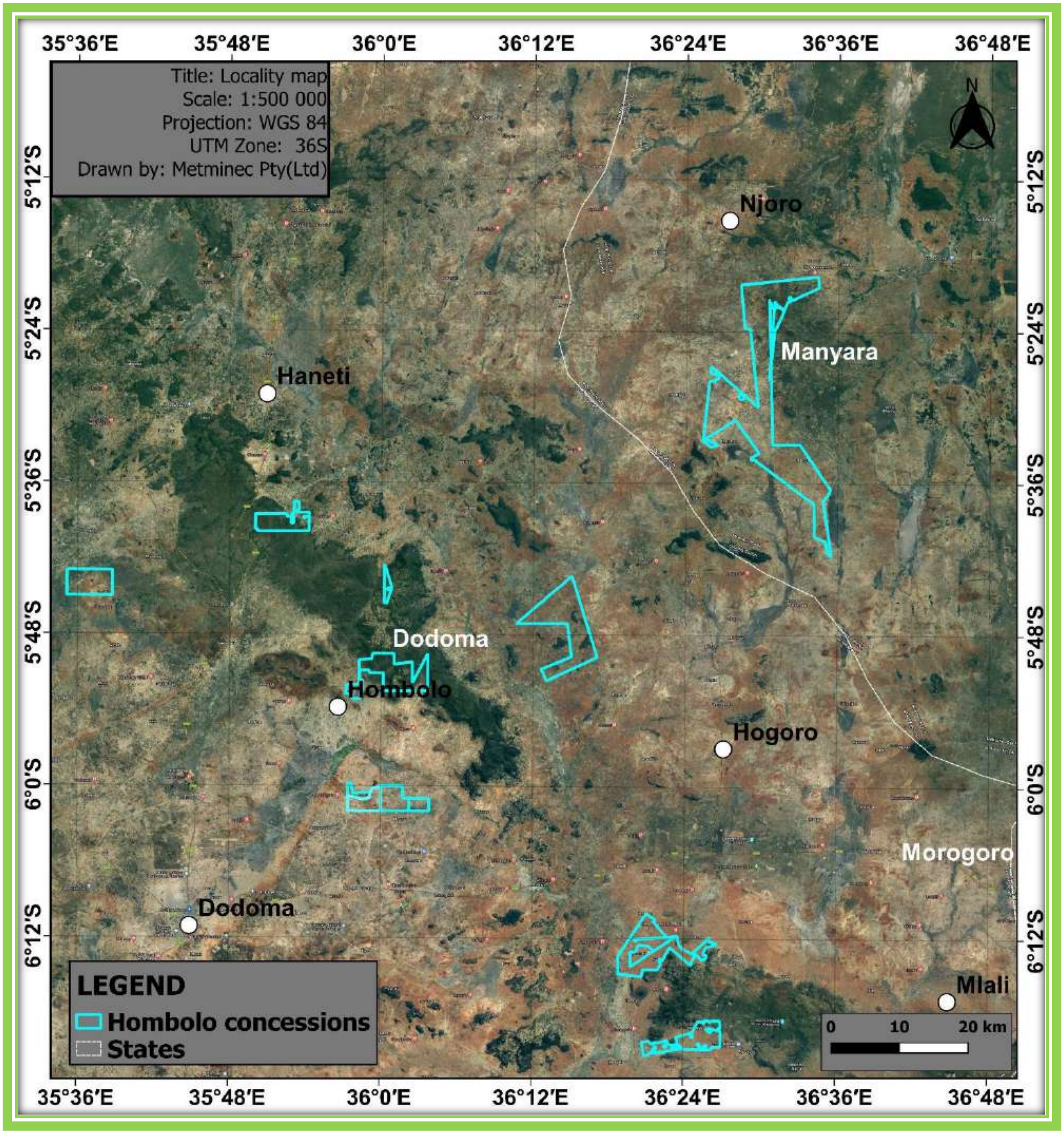

Figure 1: Locality map of the project area.

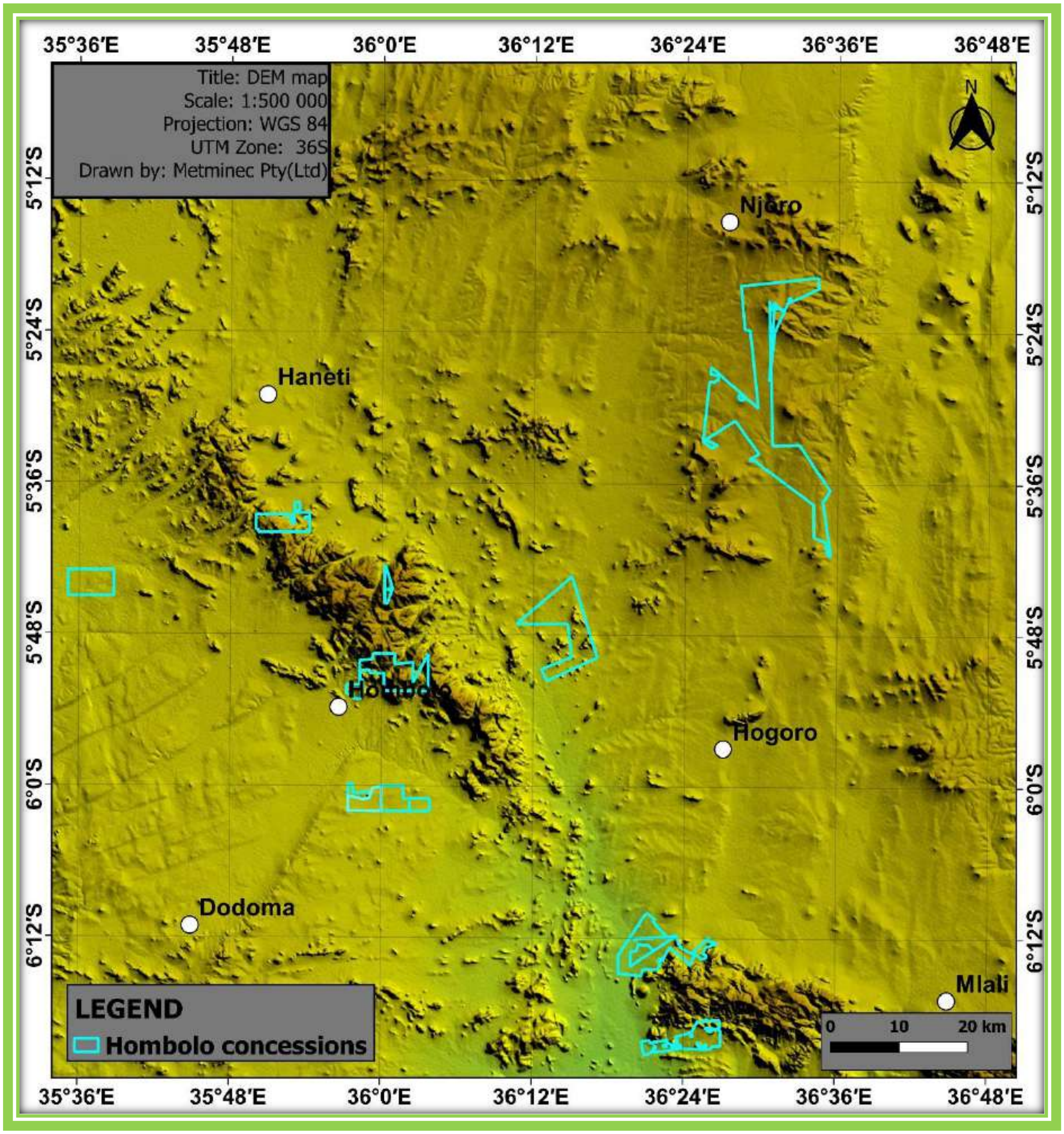

Figure 2: Topographical map of the project area.

2. BACKGROUND

Lithium ore is a type of rock or mineral that contains significant concentrations of lithium, a soft, silver-white alkali metal (Mat, 2023). This metal is known for its unique properties such as low density, strong corrosion resistance and fatigue resistance; thus, making lithium a basic raw material for various resources, such as light alloys, atomic reactors and lithium batteries. With the increase of strategic emerging industries, such as aerospace, and its use in nuclear and new forms of energy, the demand for lithium has steadily risen, which further highlights its use (Chen et al., 2023). Consequently, this has resulted in the increase of exploration of lithium resources and research on accessing lithium resources world-wide.

2.1. OCCURRENCE OF LITHIUM ORE IN NATURE

Lithium is a relatively rare element, although it is naturally found in various geological settings, but always in very low concentrations (Garrett, 2004). The average amount of lithium in the Earth's upper crust has been estimated to be as low as 20 ppm by Vine (1980) and as high as 60 ppm (Deberitz, 1993). The economic lithium resources are typically found in pegmatites, sedimentary and brine deposits (Adibhatla et al., 2023).

2.1.1. Pegmatite Deposits

Pegmatites are holocrystalline rocks typically composed of igneous rock-forming minerals that are, in part, very coarse grained, although some are extremely varied in grain size and show abundance of crystals with skeletal, graphic, or other strongly directional growth-habits. They are commonly granitic in composition, consisting mainly of quartz, feldspar and mica. Pegmatites are an important source of rare metals including lithium, tin, tantalum, niobium, beryllium, cesium, rubidium, scandium, thorium, uranium and rare earths (London, 2008). Most of these metals are considered to be strategic metals which refer to metals that are of greatest risk to supply disruptions or are important to a country's economy or defense (Linnen et al., 2012).

Although, pegmatites are widespread and relatively common, rare metal pegmatites make up only about 0.1% of the total and lithium-rich pegmatites, referred to as lithium-cesium-tantalum (LCT) owing to their enrichment in lithium, cesium and tantalum, are an even smaller fraction (Laznicka, 2006). The LCT pegmatites account for about one-fourth of the world's lithium production (Naumova and Naumova, 2010), one-tenth of the beryllium (Foley et al., 2016), most of the tantalum and all of the cesium (USGS, 2011). In addition, LCT pegmatites are also a major source of tin, tantalum, rare earths, tourmaline, etc. (Dwight et al., 2010).

It is important to note that many of the known pegmatite districts that are of interest today for lithium originally attracted attention for other rare metals, especially tin and tantalum (Kesler, 2012). This can be attributed to the rapid development of emerging industries which has resulted in the increase of lithium demand in various applications.

In terms of economic extraction of lithium in pegmatites, grades of about 1% Li_2O have historically been required for economic extraction, although lower grades have been acceptable in pegmatites that produce more than one metal. Spodumene ($LiAlPO_4(F,OH)$) is the most important lithium mineral in pegmatites including lepidolite ($KLi_2AlSi_4O10F_2$) and petalite ($LiAlSi_4O_{10}$) (Kesler, 2012).

Lithium-rich pegmatites have been found on all continents, including Antarctica, in orogenic belts ranging in age from Mesoarchean to Cenozoic including Archean cratons. Examples of major LCT deposits in Africa are Bikita in Zimbabwe Craton, Alito Ligonha in Mozambique Mobile Belt (MMB), and Manono-Kitolo (Democratic Republic of Congo) and Gatumba (Burundi) in Kariba Mobile Belt (KMB) (Dwight et al., 2010).

2.1.2. Brine Deposits

Lithium can also be found in brine deposits. The deposits are formed because of lithium's higher solubility than most other cations, which enables it to sometimes concentrate in flowing and cooling magma and/or its accompanying aqueous fluids, as well as in evaporating brines. The high-lithium brines usually have obtained most of their lithium from geothermal waters, with perhaps some of the lithium coming from surface leaching of volcanic ash, clays or other rocks (Garret, 2004). Generally, lithium-rich brine deposits are rich in lithium salts such as lithium chloride, lithium carbonate, and lithium hydroxide. Examples of major salt brine deposits are Salar de Atacama (Chile), Salar de Hombre Muerto (Argentina), Salar de Uyuni (Bolivia) and Clayton Valley (USA) (Mat, 2023).

2.1.3. Sedimentary Deposits

Lithium can also occur in sedimentary deposits, with lithium being derived by the dissolution and leaching of adjacent lithium-rich volcanic materials. These deposits tend to occur in argillaceous sedimentary rocks with a large proportion of shale or muddy sedimentary rocks, but rarely in carbonate rocks, because lithium is easier adsorbed by clay minerals in the process of deposition (Wang et al., 2020). The components of mudstone and shale are mainly clay minerals. Lithium is found in a mineral group called smectites, especially in hectorite (smectite type) which is rich in both magnesium and lithium (Pistilli, 2023). Sedimentary rock deposits account for about 8 percent of known global lithium resources. Examples of major sedimentary lithium deposits are Thacker Pass (USA), and Jadar (Serbia) (Mat, 2023).

3. GEOLOGICAL SETTING

3.1. REGIONAL GEOLOGY OF THE PROJECT AREA

Regionally, the project area is situated within the East African Rift (EAR) (Figure 3). Tanzania Craton is located in the center of EAR. This craton is bound to the east and west by Mozambique Mobile Belt and Kariba Mobile Belt, respectively. The project area forms part of Tanzania Craton and Mozambique Mobile Belt. Tanzania Craton is comprised by Palaeo-to Mesoarchean basement which is largely characterized by diorite to granodiorite orthogneisses with inclusions of supracrustal rocks including quartzite. This basement is overlain by granitoid-greenstone belts (~2700 Ma) in northern and central Tanzania (Kabete et al., 2012; Thomas et al., 2016). Kariba Mobile Belt is characterized by Early Proterozoic schists and gneisses and, less frequently, Archean granitoids, granulites and greenstones emerge in cores of uplifted blocks (Pohl, 1994). Meanwhile, the Mozambique Mobile Belt is mostly comprised of granitic rocks and amphibolite-grade gneisses formed during Proterozoic period.

Mineralized pegmatites occur in cratons which have remained stable over the past 1500 Ma - as well as in the comparatively younger orogens, consisting of mobile zones which have undergone a number of orogenic deformations during the past 1200 Ma (Clifford 1966). However, most extensive mineralized pegmatite areas so far known are associated with the younger orogens such as Kariba Mobile Belt and Mozambique Mobile Belt (Figure 2), with the exception of important lithium-bearing pegmatites of Bikita which are found in much older basement rocks of the Zimbabwe Craton (von Knorring and Condliffe, 1987). Hombolo, which is located in Tanzania Craton and forms part of the project area, is one of cratonic hosts of lithium-bearing pegmatites although it is not as extensively mineralized as those of Zimbabwe Craton (von Knorring and Condliffe, 1987). Tanzania Craton also hosts mineralized pegmatites at Dulu, Nemazi, etc. (Geological Survey of Tanzania).

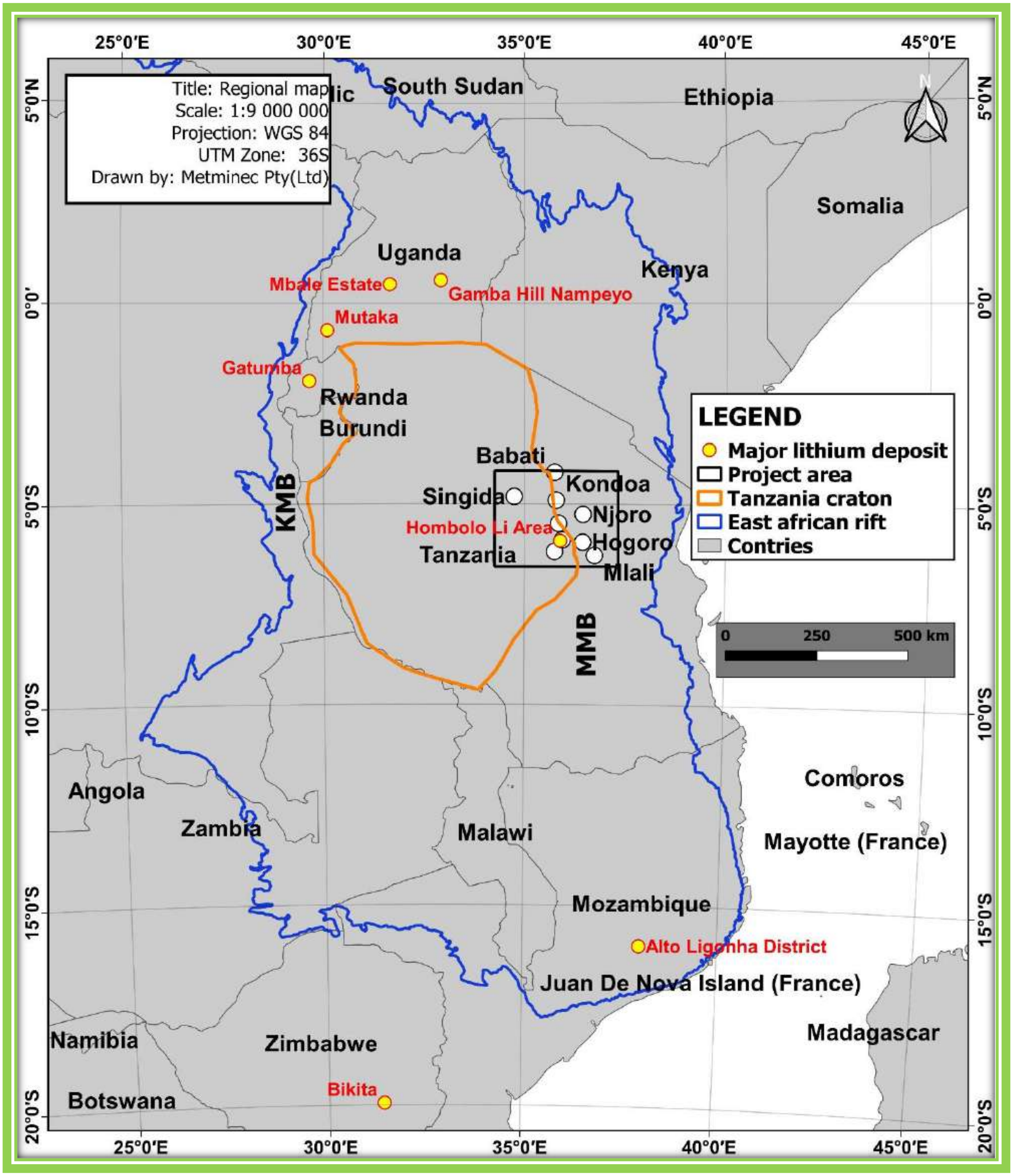

Figure 3: Tectonic region underlying the project area (KMB: Kariba Mobile Belt; MMB: Mozambique Mobile Belt)

The major mineralized pegmatites in the Kariba Mobile Belt are situated around Gatumba area in the north western part of Rwanda where many lithium pegmatites have been mined for cassiterite, beryl, amblygonite-montebrasite, and niobium-tantalum minerals, for a considerable time (von Knorring and Condliffe, 1987). In Uganda, the Kariba Mobile Belt hosts several large lithium-bearing pegmatites (such as Mbale estate and Napeyo) which have been mined in the past for amblygonite, beryl, feldspar, mica, and tantalite including the rare bismutotantalite.

In the Mozambique Mobile Belt, the major lithium pegmatite area is the Alto Ligonha region which comprises the highly mineralized lithium pegmatites of Muiane, Mutala, Morrua, and Marropino. Apart from lithium, exceptional concentrations of rare earth elements have been noted in the region (e.g., cesium, beryllium, scandium, yttrium, rare-earths, zirconium, hafnium, niobium, tantalum, antimony, and bismuth. These lithium-cesium-tantalum (LCT) pegmatites intruded chlorite phyllite and gneisses with amphibole and biotite (von Knorring, 1970).

Tectonically, the project area is situated in a region with favorable geological conditions for lithium deposit occurrence. Both Tanzania Craton and Mozambique Mobile Belt are known to host mineralized lithium pegmatites.

3.2. LOCAL GEOLOGY OF THE PROJECT AREA

The prospecting concessions are underlain by various lithological units. The concessions within the Tanzania Craton are predominately characterized by quartzite, granitoids, mica schist, amphibole schist, and quartz-feldspar gneiss rocks of the Dodoma Formation. This formation is located within the NW-SE oriented Hombolo-Msangani belt (CMD, 2022), which is hosts to the classic Hombolo lithium-bearing pegmatites. To the east of the craton, the Mozambique Mobile Belt is characterized by meta-igneous and meta-sedimentary lithological units including granulite, migmatite and granites. This orogen hosts relatively large number of prospecting concessions. In fact, all prospecting concessions of Haneti and Kondoa regions are restricted within the Mozambique Mobile Belt. On the other hand, the prospecting concessions of Singida region are limited to Tanzania Craton.

The pegmatite lithium deposits in project area are typically found within amphibolite schist, quartzite and quartz-feldspar gneiss as dykes, veins and lenticular bodies. The emplacement of pegmatites is believed to be structurally controlled and trends in NW-SE direction. The lithium deposits are found in the form of spodumene and lepidolite, which are the most common lithium-bearing minerals. In addition to these lithium-bearing minerals, pegmatites in the project area are also a major source of tourmaline, beryl, moonstone and mica. The pegmatites generally range from 50 to 1000 m long in the region (CMD, 2022). Figure 4 shows generalized lithological units characterizing the prospecting concessions and known mineralized pegmatites in the project area acquired from the Geological Survey of Tanzania GIS database portal.

4. RECENT EXPLORATION WORK IN THE PROJECT AREA

There are few reports and articles that have documented some of the recent exploration work in the project area, especially around the historic Hombolo Lithium Block. About 25 km north-west of Hombolo, Chenene Lithium Project which is being carried out by Cassius Mining Limited (CML), recently discovered pegmatites up to ~1 km long along gneiss outcrop at Dulu and Nemazi areas (Figure 4). In one of the target areas of CML, rock chips in quartz-feldspar gneiss assayed up to 5.2% Li_2O (CML, 2022).

According to a document published by Auroch Minerals Ltd on the 24 May 2016; Liontown Resources Ltd which is conducting exploration in the historic Hombolo Lithium Block (Figure 4), reported mineralisation with grade up to 5% Li_2O and 0.11% Ta in the pegmatites that are associated with regional metamorphic basement rocks in the area. Also, Auroch Minerals Ltd is conducting exploration within the Hombolo Lithium Block with initial planned exploration work including trenching, mapping and sampling of pegmatites and soil sampling (Auroch Minerals LTD, 2016).

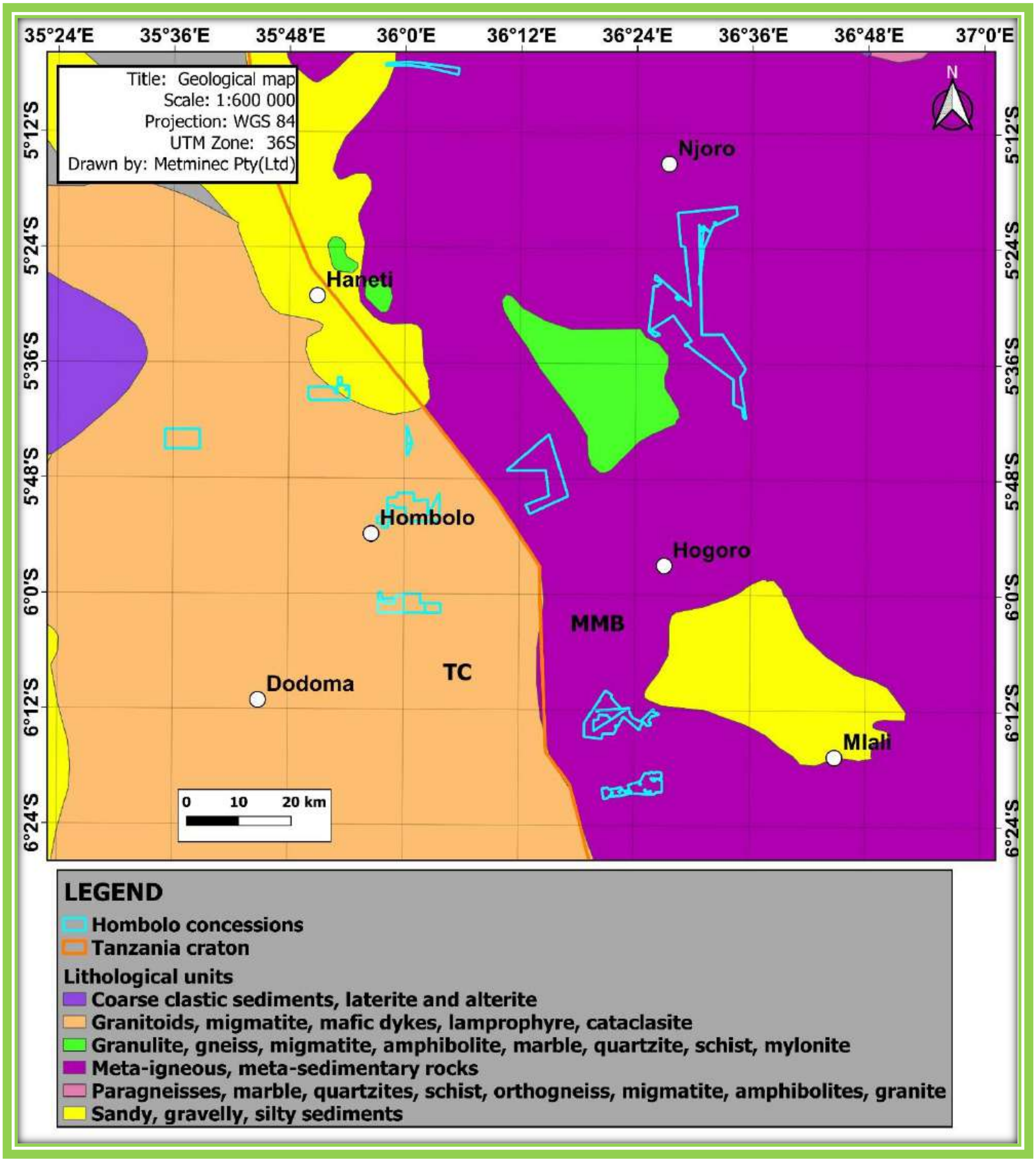

Figure 4: Geological map of the project area (Geological Survey of Tanzania).

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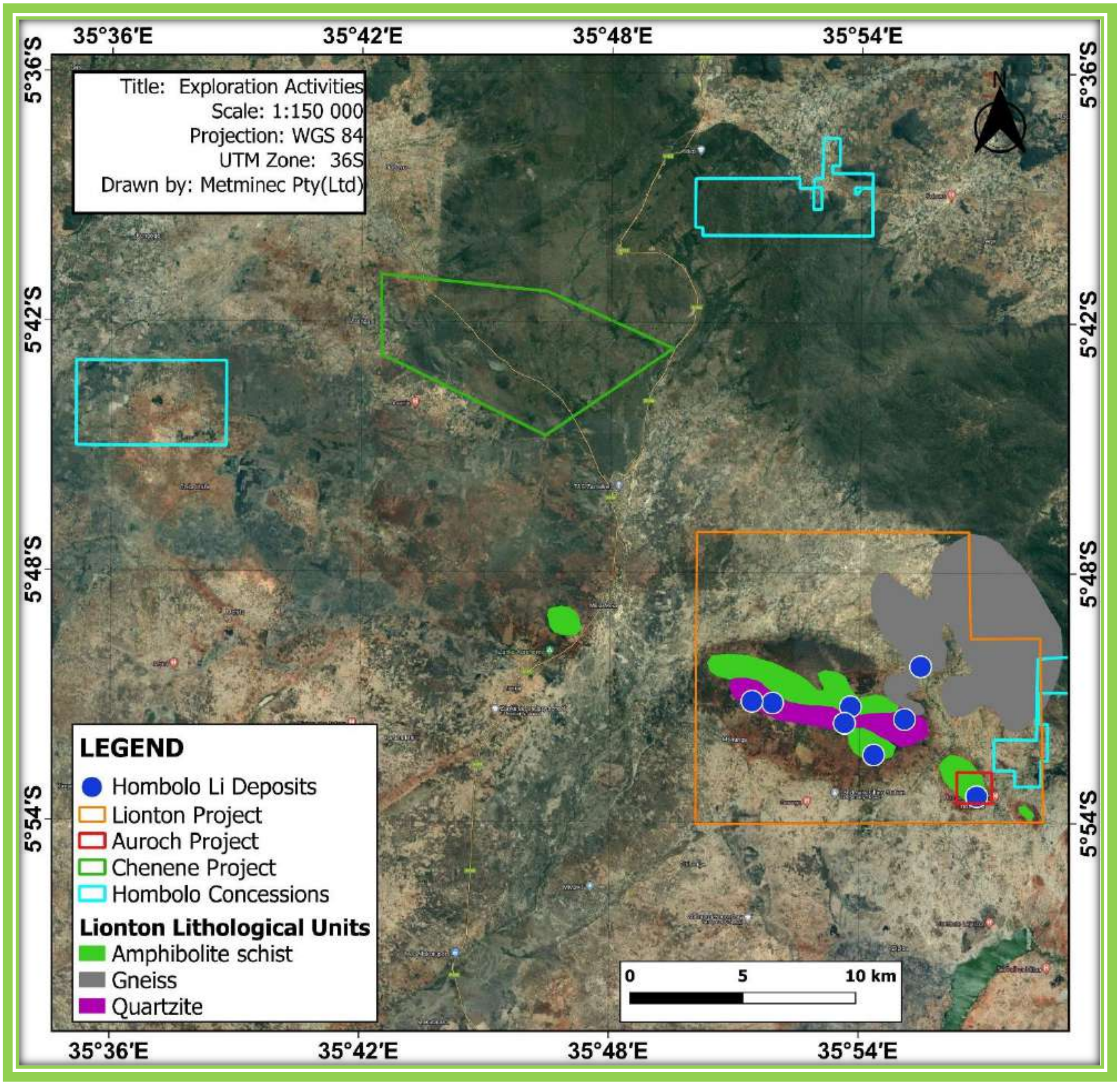

Figure 5: Recent exploration and mining operations in the project area.

5. TARGET GENERATION WITHIN CONCESSIONS

The lithium prospectivity is generally based on the existence of lithological units that are known to host lithium-bearing minerals in a region. Geologists conduct field mapping on the ground and sample the lithological units making up the geology of a region. Though this strategy has had its fair share of success world-wide, it can be cumbersome, costly and time consuming. On the other hand, remote sensing has proven to be fast and cheap in gathering lithological and mineralogical information over a wide region including areas that are considered inaccessible. As a result, this technique has been widely and successfully applied in locating follow-up targets for potential mineral deposits at an earlier stage of mineral exploration (Ali and Pour, 2014; Fernandes et al., 2017; Muavhi and Mavhungu, 2020; Muavhi et al., 2021; Muavhi, 2022).

The application of remote sensing in mapping of these mineral targets depends on the capacity and capability of a sensor to register spectral signatures related to minerals associated with such deposits (Muavhi et al., 2021). This technique is mainly used to map minerals associated with hydrothermal alteration zones of copper and gold deposits, with limited published work on mapping of potential lithium-bearing areas using remote sensing technique. Nonetheless, few existing studies have demonstrated the capabilities of this technique in successfully mapping of lithium-bearing potential areas using Landsat remote sensing images (e.g., Ali and Pour, 2014; Fernandes et al., 2019).

5.1. DATASETS

The Landsat 8 (OLI) image scene covering the project area was retrieved from USGS Earth Explorer. The Landsat scene was corrected for geometric distortion and atmospheric noise to enhance the quality of the image. Log residuals algorithm was then applied to convert radiance data to ground reflectance data. This is crucial when mapping minerals on the ground using remote sensing data (Muavhi and Mavhungu, 2020). The processing of Landsat images was achieved using ENVI software. Table 1 shows characteristics of Landsat 8 (OLI) bands.

Table 1: Spectral and spatial characteristics of Landsat 8 (OLI) bands.

Spectral region	Band number	Central wavelength	Spatial resolution (m)
VNIR	2 (Blue)	0.483	30
	3 (Green)	0.560	
	4 (Red)	0.660	
	5 (NIR)	0.865	
SWIR	6 (SWIR-1)	1.650	30
	7 (SWIR-2)	2.200	

5.2. BAND RATIO

The band ratio is an information extraction technique that results from the division of one band for another with the aim of highlight certain spectral differences. The ratios are based on the peaks and troughs of a reflectance curve; usually, the band with higher reflectance is divided by a band with low reflectance. This method is useful for highlighting certain features or materials that cannot be seen in raw bands (Ali and Pour, 2014).

Fernandes et al. (2019) proposed several Landsat band ratios for mapping potential lithium-bearing minerals. These researchers successful mapped spodumene and lepidolite using Landsat band3/band5 and band4/band7, respectively. Following the proposed band ratios of Fernandes et al. (2019), maps for lithium-bearing minerals were created in order to generate potential follow-up targets within the concessions in Kandoa, Haneti, Hombolo and Singida.

5.3. VALIDATION OF THE REMOTE SENSING RESULTS

Validation is one of the most crucial steps in assessing the accuracy and performance of any mapping tool, in our case the band ratio technique used to map lithium-bearing minerals. Receiver operation curve and area under curve (ROC-AUC) analysis is the most applied method in assessing the accuracy and performance of mapping tools such as models and algorithms (e.g., Andualema and Demeke, 2019; Arshad et al., 2020; Muavhi and Mutoti, 2022).

The ROC-AUC analysis is a standard method applied to assess the accuracy of a diagnostic test. It plots the false positive rate on the X-axis and the true positive rate on the Y-axis. ROC prediction curve represents the trade-off between the two rates (Negnevitsky, 2002). The AUC values range from 0 to 1 corresponding to 0-100%. In terms of prediction accuracy, AUC values can be classified as follows: poor (< 50%), average (50 - 70%), good (70 - 80%), very good (80 - 90%) and excellent (90 - 100%) (Fawcett, 2006).

In this study, the known lithium-bearing pegmatites from Hombolo Lithium Block were used to assess the accuracy of the remote sensing results. The pegmatites were overlain with the mineralogical map in ArcGIS environment using ArcSDM tool for ROC-AUC analysis. Since these pegmatites are known to host lepidolite and spodumene if remote sensing results are accurate there should be a strong correlation between these pegmatites and remote sensing results.

6. RESULTS OF TARGET GENERATION

A total of forty-seven targets were generated in prospecting concessions of Hombolo (Appendix A). Like in other concessions, spodumene form a distinct closed geologic feature distributed throughout the project area (Figure 6). Meanwhile, lepidolite dominates the western part of the project area (Figure, 7). Also, these lithium-bearing minerals can be seen within the historic Hombolo Lithium Block. They extend beyond the block forming a major cluster, around the concession in the west. This cluster corresponds to the trend of Hombolo-Msangani belt of the historic lithium deposit exploration and mining (Stockley, 1942; Harpum, 1953) which is still on-going to date (CMD, 2022).

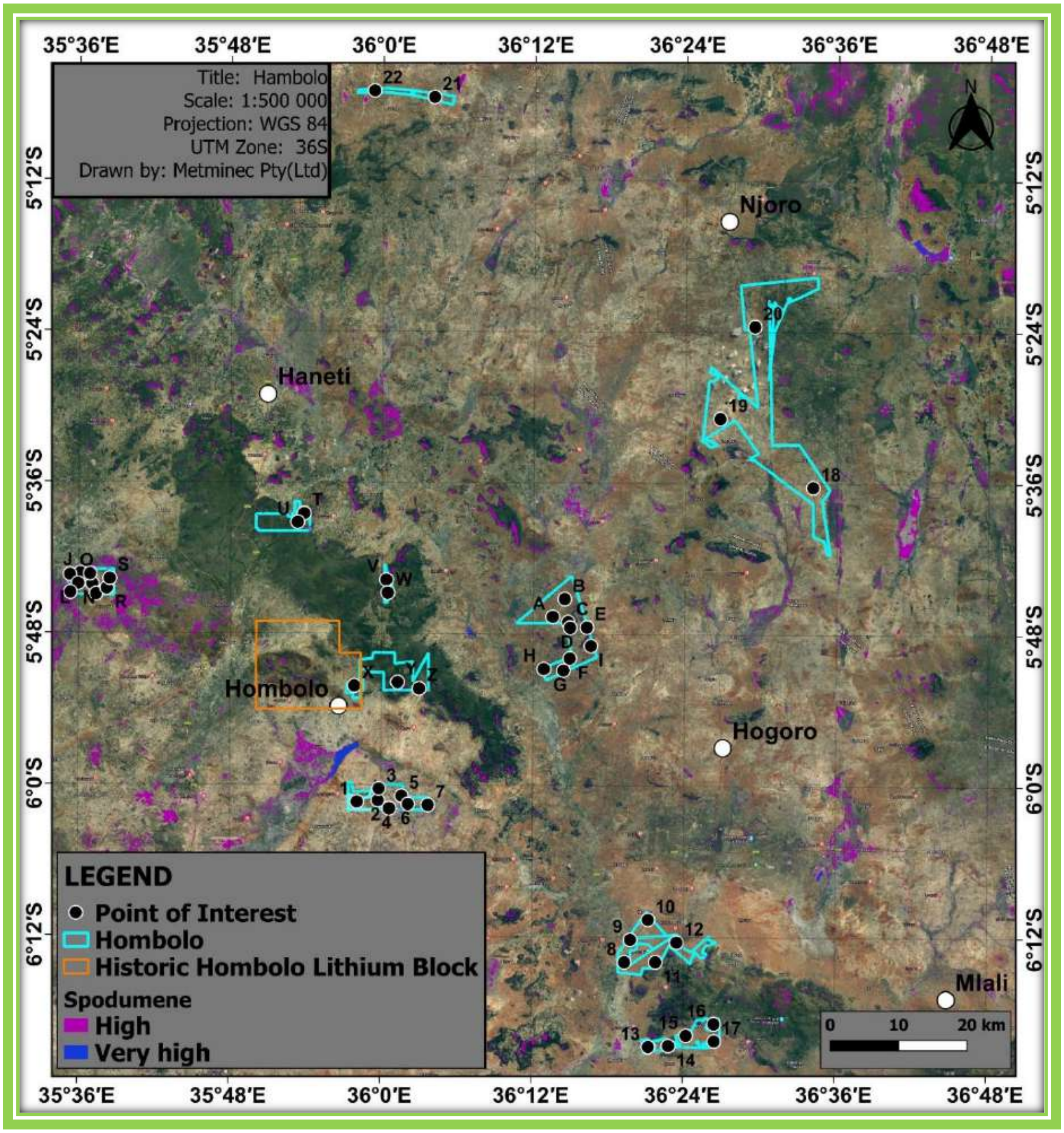

Figure 6: A true colour image showing areas with high potential of spodumene in Hombolo. Historic Hombolo Lithium Block is superimposed as well.

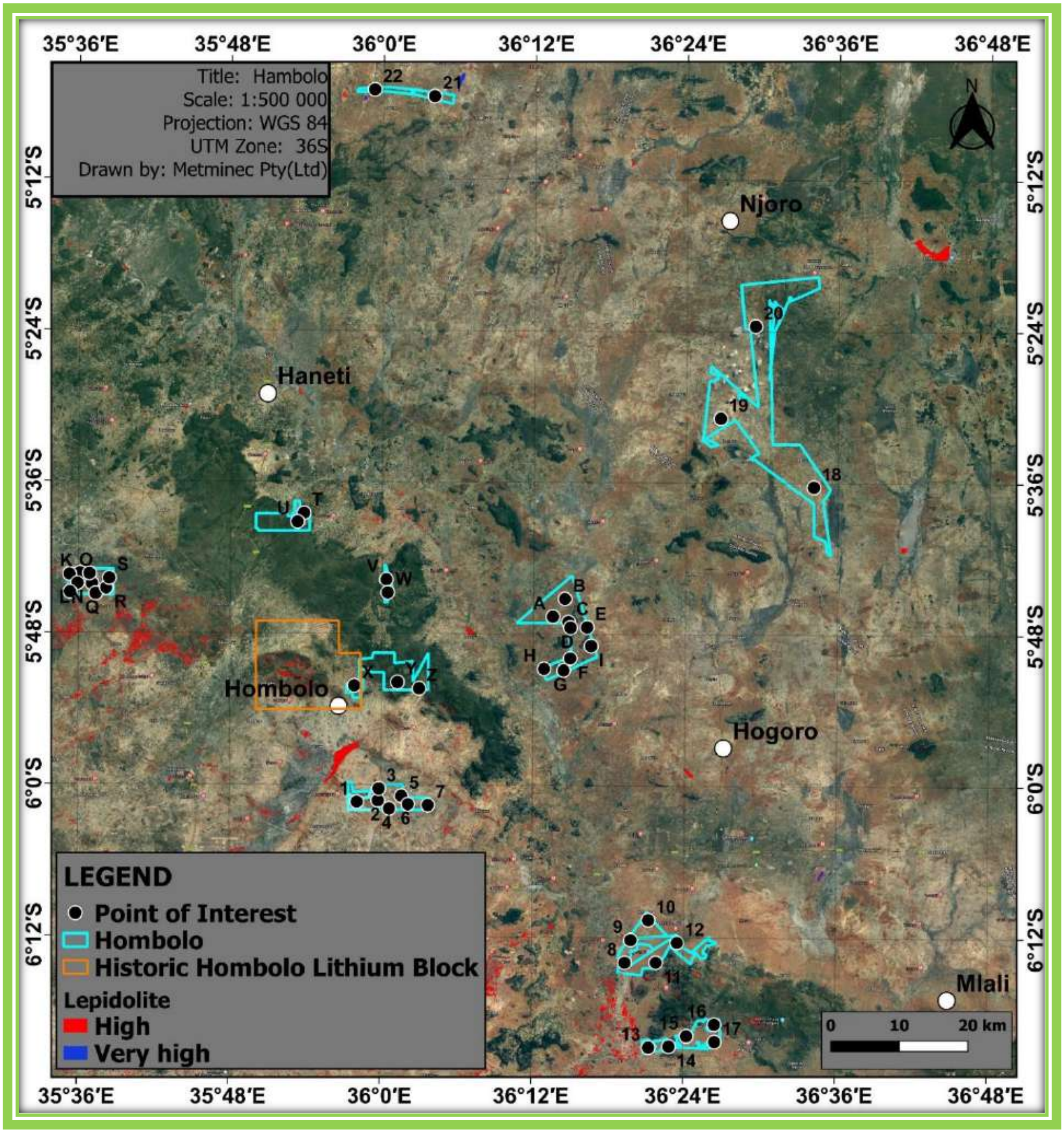

Figure 7: Lepidolite superimposed on satellite image.

6.1. ACCURACY ASSESSMENT RESULTS

ROC curve analysis was utilized to assess the accuracy of the generated mineral maps by comparing known lithium-bearing pegmatites with the generated mineral maps. Figure 8 shows the ROC curve displaying the accuracy of mineral mapping results. The results attained an AUC of 90%, which indicates excellent mineral mapping (Fawcett, 2006).

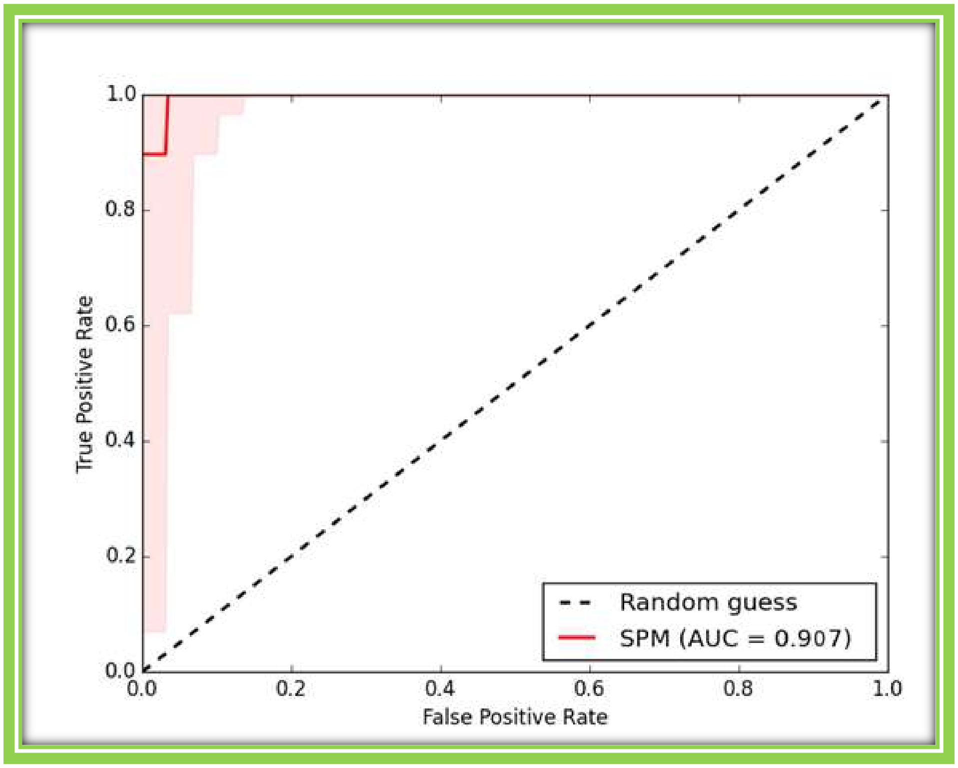

Figure 8: ROC curve showing the accuracy of mineral mapping results (SPM: Spodumene-Lepidolite Map)

7. RECONNAISSANCE SURVEY FINDINGS & OBSERVATIONS

From 11 to 18 September 2023, a 3-person team of professionals with a wealth of experience in the mining sector, comprising two (2) geologists from Metminec, namely its Managing Director Godfrey Mathapo, and Permly Shingage, accompanied by, George Du Plessis visited Tanzania. This team launched out from the capital city of Dodoma, to undertake a 7-day reconnaissance survey in order to make field observations on the proposed lithium prospecting concessions as required by CGRA. The concessions included; Hombolo, Haneti, Kondoa and Singida.

The aim of this reconnaissance mission was to visit areas of interest and implement an exploration programme on selected sites thereafter. The team arrived in the morning at the Dodoma City Hotel (Best Western) and met with Mr. Amaar of Sun Mining. The team was introduced to the Department of Home Affairs in Dodoma and then later met with representatives of the ministry of minerals in Dodoma to alert them about the presence of reconnaissance team in the area and the purpose for the visit. The next trip was to the Geological Survey of Tanzania to get some geological information and purchasing of maps, including enquiring about equipment, at the Geological Survey Department. Lastly, the team visited the Tanzania State Mining Company (TSMC) to enquire about their drilling services. There the team was introduced to the TSMC Director Mr. Alex Cyprian who gave a brief talk on the services that TSMC offers. Figure 9 is the picture showing the meeting of the stakeholders.

Figure 9: Stakeholder engagement and project introduction.

On 13 September 2023, the reconnaissance team and tour guide provided by the local authorities, visited the targeted sites in Hombolo area following high anomaly zones based on the results of Landsat remote sensing image processing. Several sites (Figure 10) were visited and the following observations were made;

- **Site no. 1:** A vast area covered with a thick soil with visible quartz and feldspar remnant which indicated an area of highly weathered pegmatite.
- **Site no. 2:** Outcrops at the foot of the mountain consisted of granitic rocks with visible veins of pegmatitic ranging from 5 to 6 cm. Most of the accessed parts of the mountain were mainly granitic rocks.

- **Site no. 3:** A mountain hill which consisted of gneissic rocks that were intruded by multiple dolerite dykes. Further on pieces of pegmatitic floats were observed and followed to an area of pegmatitic material.
- **Site no. 4:** The Hombolo mine. The high wall perfectly depicted an older amphibolite intruded by a thick white pegmatite rock, which is believed to be the host of lithium mineralization (Figure 11). Bags of rock samples were also observed within the vicinity of the mine and basically contained the micaceous pegmatite (Figure 12).

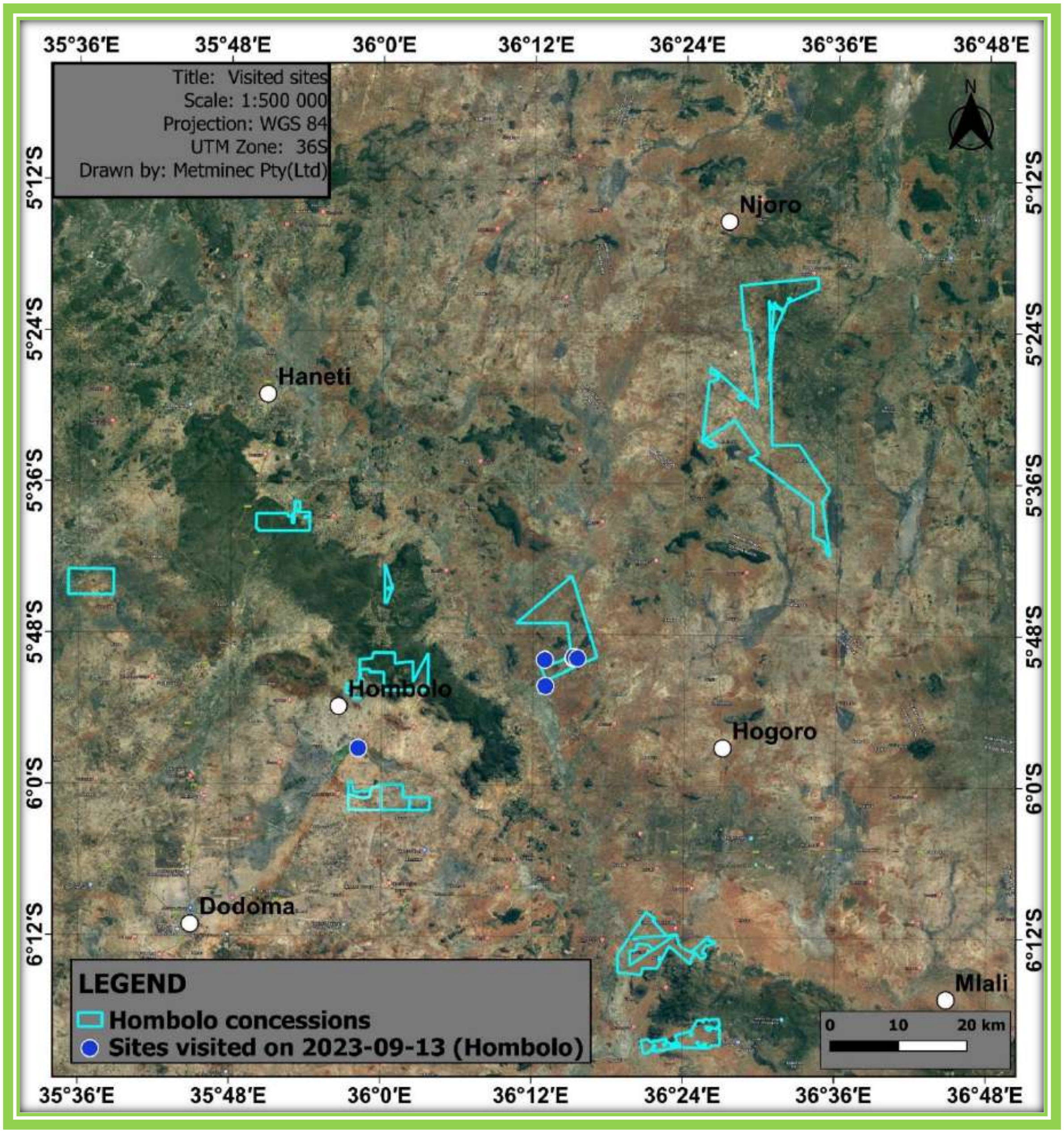

Figure 10: Hombolo mine pit showing the pegmatite intrusion.

Figure 11: Hombolo mine pit showing the pegmatite intrusion.

Figure 12: Typical pegmatite ore.

SUMMARY AND CONCLUSIONS

Lithium is a critical and strategic metal used in various applications, especially in the production of rechargeable batteries, which are used in a wide range of devices such as electric vehicles, mobile phones, laptops, and energy storage systems. Owing to its high demand, the search and exploration for lithium deposits has spiked in recent years. The high demand of lithium has also triggered the revisiting and re-evaluating of vicinities of historically known lithium deposits including under-explored regions and under-appreciated deposits which were abandoned because they were deemed small or economically not viable before the recent spike in lithium demand.

In addition to this, the advances in lithium exploration methods involving:

(a) the use of high-resolution geophysical surveys and recent sophisticated geophysical data processing techniques;

(b) advanced remote sensing applications, and

(c) overwhelming research studies on the geochemistry of pathfinder elements of lithium deposits have benefitted greatly the search and discovery of new lithium deposits world-wide.

In this desktop study, remote sensing images, specifically Landsat 8 (OLI) images, were processed using ENVI software to locate areas that have potential to host lithium deposits by spectrally mapping lithium-bearing minerals: spodumene and lepidolite. This was done to generate follow-up targets within the prospecting concessions of Hombolo region. Hombolo area is the historic host of lithium-bearing pegmatites which makes its vicinity one of the main attractions for the search of new lithium deposits in Tanzania.

Following the Landsat image processing results, several follow-up targets were generated within the prospecting concessions. Some of these targets correspond to closed geomorphic features forming lenticular-like bodies, which is a diagnostic morphological feature of some of the lithological units hosting pegmatites in the region. In the western part of the Hombolo region, there is NW-SE oriented broad linear mineral cluster cutting across the Hombolo Lithium Block and extending to prospecting concession to the west. This mineral cluster corresponds to the NW-SE oriented Hombolo-Msangani belt which is known to host historic Hombolo lithium-bearing pegmatites; thus, making this linear mineral cluster one of the areas to prioritize for lithium exploration.

The mineral results generated from processing of Landsat images attained an accuracy of 90%, thus implying excellent mineral mapping. Site visit observation and findings at the selected follow-up targets further validate the mineral maps since the sites visited with the guidance from mineral mapping results are characterized by pegmatitic rocks and/or materials.

Based on the combined interpretation of mineral mapping results, topography, geology and field observation, these concessions: PL/11955/2022; a portion of PL/17271/2021; and PL/19510/2022 were assigned highest prospectivity level among the concessions in Hombolo region. These concessions are characterized by high anomalies of spectrally mapped lithium-bearing minerals, flat terrain and proximal to known pegmatites. In addition to these, PL/11955/2022 is along the Hombolo-Msangani belt which is a host to Hombolo lithium-bearing pegmatites. A portion of PL/17271/2021 is adjacent to Auroch Lithium Exploration Project Block. The Auroch block is part of the Hombolo Lithium Block.

In light of the findings, Metminec recommends the following:

- Site visit of generated follow-up targets;
- Carry out chip sampling and/or soil sampling at generated targets within prospecting right concessions;
- Geophysical survey to delineate potential lithium deposits;
- Complement existing geological maps with the current generated mineral maps to target new prospective areas for future lithium prospecting right applications.

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APPENDICES

Appendix A: Coordinates of located follow-up targets in Hombolo concessions.

Point ID	X_Coord	Y_Coord
A	36.22553	-5.77699
B	36.24129	-5.75346
C	36.24595	-5.78395
D	36.24875	-5.79134
E	36.27058	-5.79087
F	36.24846	-5.83198
G	36.23996	-5.84787
H	36.21415	-5.84595
I	36.27605	-5.81546
J	35.60196	-5.72145
K	35.58822	-5.7231
L	35.59885	-5.73497
M	35.58886	-5.74653
N	35.61762	-5.73541
O	35.61452	-5.72219
Q	35.6227	-5.74849
R	35.63667	-5.74128
S	35.64058	-5.72816
T	35.89698	-5.64137
U	35.88847	-5.65293
V	36.00577	-5.72877
W	36.00761	-5.74602
X	35.96414	-5.86901
Y	36.02098	-5.86427
Z	36.04957	-5.87249
1	35.96814	-6.02251
2	35.9959	-6.02058
3	35.997	-6.0049
4	36.01073	-6.03115
5	36.02689	-6.01449
6	36.03552	-6.02539
7	36.06182	-6.02642
8	36.32241	-6.23308
9	36.33015	-6.20315
10	36.35331	-6.17687
11	36.36346	-6.23282
12	36.39128	-6.2065

13	36.35435	-6.3449
14	36.38115	-6.3434
15	36.40423	-6.32968
16	36.44086	-6.3142
17	36.44135	-6.33705
18	36.56817	-5.60506
19	36.4453	-5.5146
20	36.49059	-5.39274
21	36.06672	-5.09067
22	35.98784	-5.08222